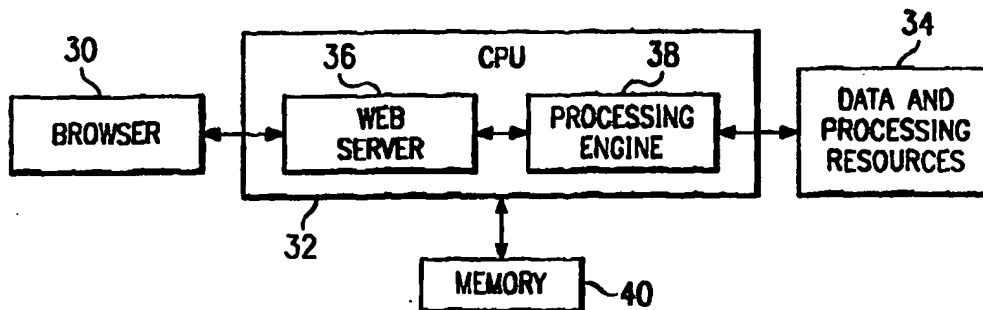




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: WEB SERVER DATA/PROCESS INTEGRATOR



## (57) Abstract

The present invention provides a processing engine (38) which extends the dynamic generation of HTML pages capability provided by a Web Server (36). The processing engine (38) interprets HTML elements which are embedded within pre-defined templates. These HTML elements reference data and process resources (34). When the Web Server (36) receives a request for one of the templates, the Web Server (36) invokes the processing engine (38) which retrieves a template, creates a new HTML page and parses the template. The processing engine (38) then retrieves information from the referenced data resource or invokes the referenced process resource to generate information. When the information is retrieved or when the invoked process resource has completed its processing, the processing engine (38) then embeds the resulting information into a new HTML page. The resulting HTML page is returned to the Web Server (36) for presentation to the user through Web Browser (30).

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## WEB SERVER DATA/PROCESS INTEGRATOR

TECHNICAL FIELD OF THE INVENTION

The present invention relates generally to Web Server technology and more particularly to dynamic generation of HyperText Markup Language (HTML) pages.

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BACKGROUND OF THE INVENTION

Current Web Server technology offers an Application Programming Interface (API) capability, such as a Common Gateway Interface (CGI), that allows for the dynamic creation of HTML pages. This capability is typically taken advantage of by a user, i.e., a software developer, using a scripting program. The scripting program may be written in one of a variety of languages including Visual Basic, C, C++, Perl, and Tcl. This scenario, however, means that in order to take advantage of the dynamic creation of HTML pages, the user must learn to use one of these, or a similar type of, programming language and must also learn to use the CGI or some other API.

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SUMMARY OF THE INVENTION

In accordance with one embodiment of the present invention a processing engine is provided which extends the dynamic generation of HTML pages capability provided by a Web Server. The processing engine according to one embodiment of the present invention interprets HTML elements which are embedded with an HTML page. These HTML elements reference external data and process resources, along with providing mechanisms for transferring data from

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the web server to the data and process resources and from the data and process resources to the dynamically generated HTML page. When the Web Server receives a request for an HTML page which includes one or more of these HTML elements, the Web Server invokes the processing engine which retrieves and parses an associated template. The processing engine then retrieves the referenced external data or invokes the referenced external process resource. When the external data is retrieved or when the external process resource has completed its processing, the processing engine then creates a new HTML page from the template and embeds the resulting information into the new HTML page and returns the resulting HTML page to the Web Server for presentation to the user through a Web Browser.

In another aspect of the present invention, the external data and process resources pre-register the associated HTML elements with the processing engine.

#### BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention, reference may be made to the accompanying drawings, in which:

FIGURE 1 shows an exemplary computer system operable to implement the present invention;

FIGURE 2 illustrates a computer implemented in accordance with the present invention;

FIGURES 3A through 3B are block diagrams depicting a portion of the computer system shown in FIGURE 2 in more detail;

FIGURE 4 is a flow diagram illustrating operation of the Web Server in accordance with the present invention; and

FIGURE 5 depicts a flow diagram showing operation of the processing engine in accordance with the present invention.

Corresponding numerals and symbols in the different FIGURES refer to corresponding parts unless otherwise indicated.

5     DETAILED DESCRIPTION OF THE INVENTION

          The present invention is implemented using one or more general purpose digital computers such as that shown in FIGURE 1. The computer shown in FIGURE 1 includes a data entry device 10 (such as a keyboard, mouse, or pointing device), a central processing unit (CPU) 12, a memory 18 and a display device 15. Other implementations will be readily apparent to those skilled in the art.

          A computer system implemented in accordance with the present invention, as shown in FIGURE 2, includes a browser 30, a CPU 32, a memory 40 and data and process resources 34. A Web Server 36 and a processing engine 38 are implemented on the CPU 32. In the computer system shown in FIGURE 2, it is contemplated that the browser 30 operates on a separate CPU than the CPU 32. It is further contemplated that the external data and process resources 34 are each implemented on different CPUs. Although shown on multiple computers in FIGURE 2, it is also contemplated, that the browser 30, the CPU 32, the memory 40 and the data and process resources 34 all exist on the same computer system. Other configurations will be readily apparent to those skilled in the art.

          The present invention is operable over a broad range of Web Server 36 interfaces including CGI, Netscape API (NSAIP), and Information Server API (ISAPI) and supports a variety of different data and process resources 34 including Arranger Business Objects and Composer procedure steps (both products of the assignee, Texas Instrument Incorporated), ODBC databases, OLE/COM objects, and CORBA-compliant object interfaces. The use of other data

and process resources 34 will be apparent to those of ordinary skill in the art.

As shown in more detail in FIGURE 3A, the processing engine 38 in accordance with the present invention includes  
5 a Web server interface 52, a processing kernel 54 and one or more data or process interfaces 56. The processing kernel 54 interfaces the processing engine 38 with the Web server interface 52 and with the various data and process resource interfaces 56. An alternative embodiment is shown  
10 in FIGURE 3B where the data and process resources 34 operates on the same CPU 32 as the processing engine 38.

Operation of the Web server 36 is shown in FIGURE 4. At decision block 60, if the Web server 36 receives a request to retrieve a template, processing continues at  
15 block 66 where the processing engine 38 is invoked.

An exemplary special URL requesting invocation of the processing engine 38 is of the form "http://host/path/file.htmt" where "file.htmt" references one of a plurality of templates. Upon the occurrence of  
20 certain pre-defined events, such as upon initiation of the processing engine 38, each of the data and process resource interfaces 56 register with the processing engine 38. The processing engine 38 then records one or more HTML elements associated with the registering data and process resources  
25 interfaces 56. The HTML elements tell the processing engine what information to pass to the registering data and process resource interfaces 56 when the templates are being parsed. When the Web server 36 invokes the processing engine 38, the processing engine 38 parses the template  
30 looking for one of the pre-defined HTML elements it has recorded for the various data and process resource interfaces 56.

When the processing engine 38 is ready to process an identified HTML element, the processing engine 38 invokes  
35 the associated data or process resource interface 56 with

information referred to by the HTML elements. When the data or process resource interface is done executing, the processing engine 38 takes the returned information from the data or process resource interface and builds a resulting HTML page based on the template and the returned information.

Once the processing engine 38 completes the processing of the template, the resulting HTML page is returned at block 68.

At decision block 60, if a request for a template was not made, then processing continues at block 64 where other requests are processed.

FIGURE 5 illustrates operation of the processing kernel 54 which interfaces the processing engine 38 with the Web server interfaces 52 and with the data and process resource interfaces 56. As shown at block 70, the processing kernel 54 retrieves the associated template from the memory 40 and crates a new HTML page from the retrieved template. The retrieved template is parsed at block 72 to find all references to the HTML elements associated with the external data and process resources 34. Each HTML element found is processed at block 74 and, at block 76, the resulting data is embedded into the new HTML page.

The parsing of the template is repeated iteratively until, as determined at decision block 80, no more HTML elements are detected. This enables the parsing and processing of nested HTML elements i.e., when sequencing invocations of multiple data and process resources 34. When no more HTML elements are detected at decision block 80, the resulting HTML page is returned at block 78.

Although the present invention has been described in detail, it should be understood that various changes, substitutions and alterations can be made thereto without departing from the spirit and scope of the present invention as defined by the appended claims.

WHAT IS CLAIMED IS:

1. A computer system for generating and processing dynamic HTML, said computer system connected to one or more data or process resources, comprising:

memory for storing a plurality of HTML elements, each of said HTML elements either identifying an associated one of the data or process resources as an associated data resource from which to retrieve information and how said associated data resource is to be accessed or identifying said associated one of the data or process resources as an associated process resource to use to generate information and how said associated process resource is to be invoked;

said memory separately storing one or more templates comprising HTML elements;

a resource interface;

a processing engine responsive, at a first time, to one of said resource interfaces and operable to record in said memory those of said HTML elements which as associated with said resource interface;

said processing engine further responsive, at a second time, to requests from a server and operable to retrieve said templates, to create a new HTML page, to parse said one of said templates and, for each of said HTML elements detected, to access said associated data resource if said each of said HTML elements detected identifies a data resource, to invoke said associated process resource if said each of said HTML elements detected identifies a process resource, and to embed said retrieved or said generated information into said new HTML page; and

said server further operable to present said resulting HTML page to a user.



2. A computer system operated method for generating and processing dynamic HTML, said computer system connected to one or more data and process resources, the method comprising the steps of:

- 5 storing, at a first time, in response to one of the data and process resource interfaces, HTML elements which are associated with said one of the data and process resource interfaces, each of said HTML elements either to identify said one of said data or process resources as an associated data resource from which to retrieve information and how said associated data resource is to be accessed or to identify said one of said data or process resource interfaces as an associated process resource to use to generate information and how said associated process resource is to be invoked;
- 10 receiving, at a second time, a request from a server; retrieving, in response to said request, one of said templates;
- 15 parsing said one of said templates to detect one of said HTML elements;
- 20 accessing said associated data resource if said one of said HTML elements detected identifies a data resource; invoking said associated process resource if said one of said HTML elements detected identifies a process resource; and
- 25 creating a resultant HTML page from one of said templates and embedding said retrieved or said generated information.

- 30 3. The method of Claim 2 further includes the step of repeating said parsing, said accessing, said invoking and said embedding steps until no more of said HTML elements are detected to generate a resulting HTML page.

4. The method of Claim 2 further including the step of either retrieving information from said server and passing said information to said associated data resource or to said associated process resource.

1/2

FIG. 1

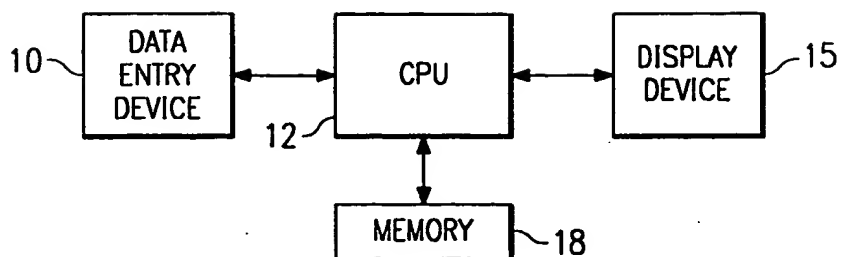


FIG. 2

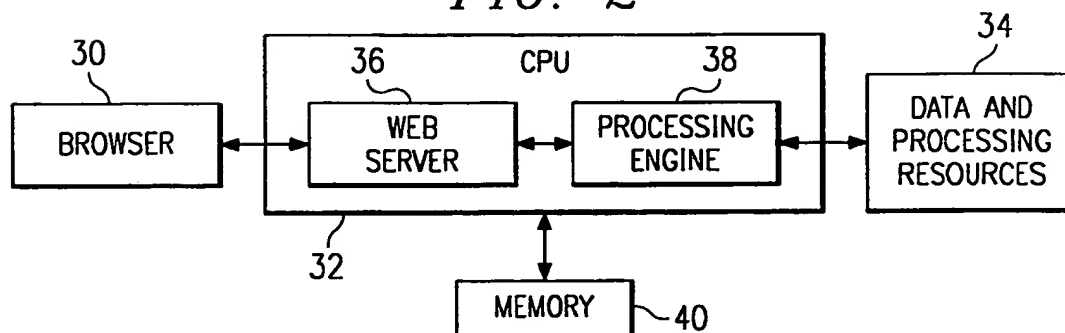


FIG. 3A

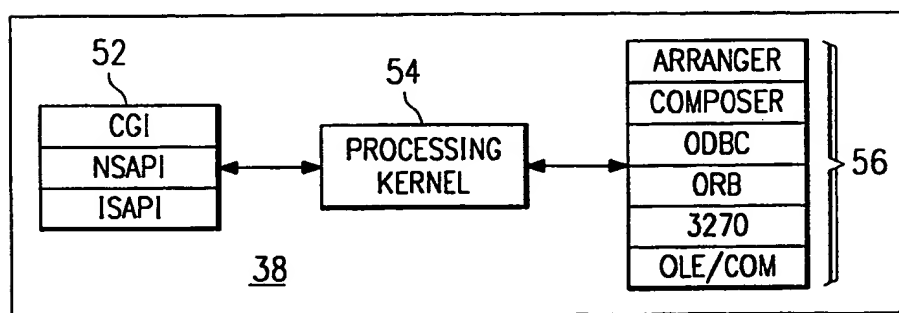
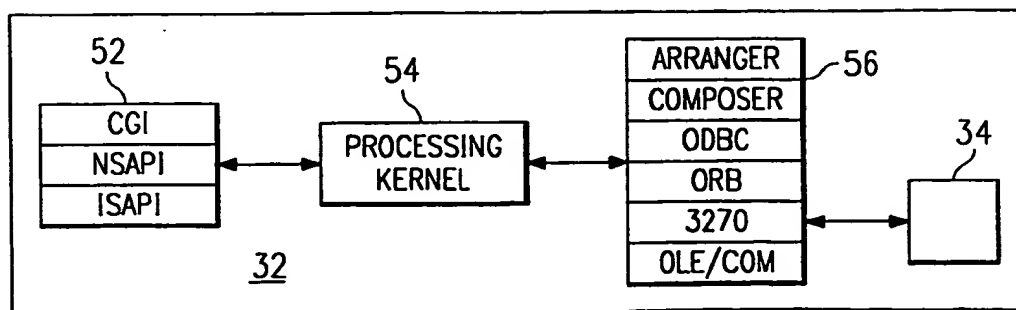


FIG. 3B



2/2

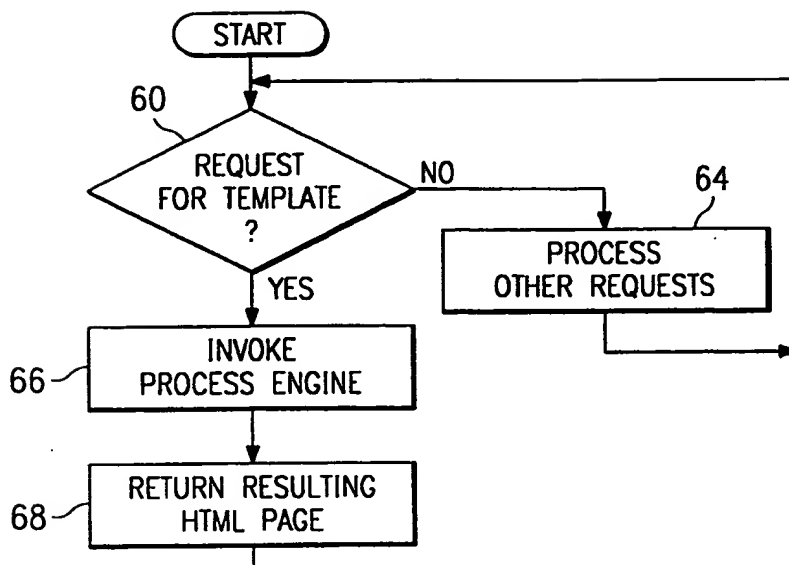


FIG. 4

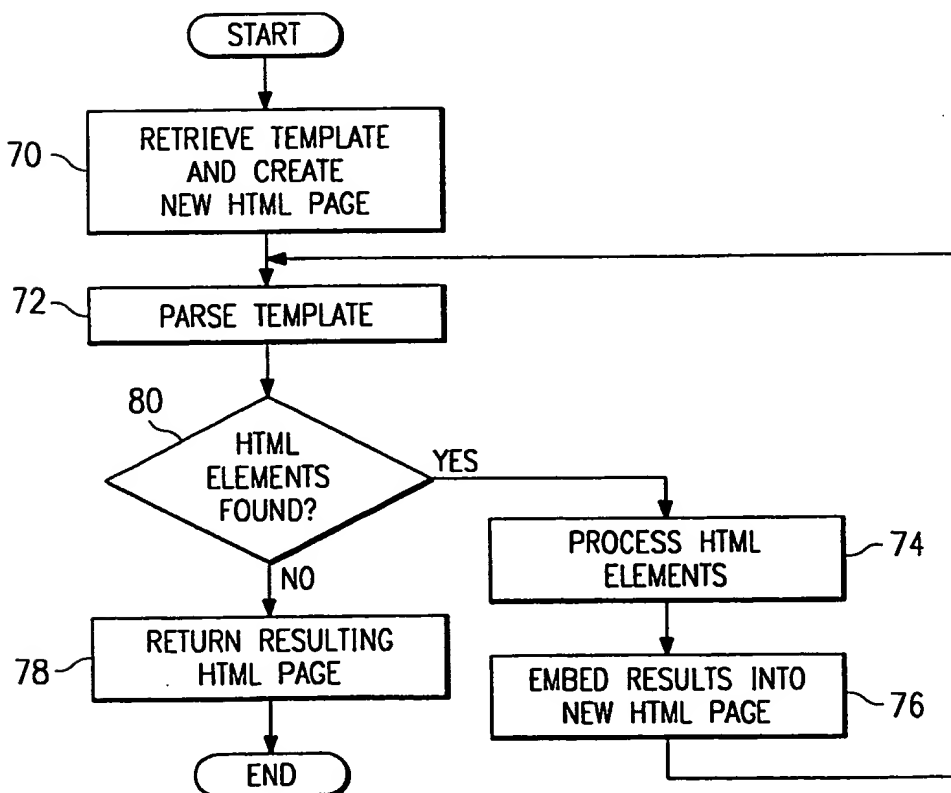


FIG. 5

# INTERNATIONAL SEARCH REPORT

Int. National Application No.

PCT/US 97/17683

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 G06F17/30

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 96 08780 A (BRITISH TELECOMM ;MCKEARNEY STEPHEN (GB)) 21 March 1996 see abstract see page 3, line 20 - page 3, line 32 see page 8, line 3 - page 8, line 29 ---	1-4
A	HU J ET AL: "WEBINTOOL: A GENERIC WEB TO DATABASE INTERFACE BUILDING TOOL" PROCEEDINGS. INTERNATIONAL WORKSHOP ON DATABASE AND EXPERT SYSTEMS APPLICATIONS, 9 September 1996, pages 285-290, XP002036862 see the whole document -----	1-4

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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